



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>7</sup> :		A1	(11) International Publication Number: <b>WO 00/17951</b>						
<b>H01M 8/04, F01P 11/06, B60L 11/18</b>			(43) International Publication Date: 30 March 2000 (30.03.00)						
<p>(21) International Application Number: PCT/CA99/00850</p> <p>(22) International Filing Date: 17 September 1999 (17.09.99)</p> <p>(30) Priority Data:</p> <table> <tr> <td>198 43 401.4</td> <td>22 September 1998 (22.09.98)</td> <td>DE</td> </tr> <tr> <td>2,247,856</td> <td>23 September 1998 (23.09.98)</td> <td>CA</td> </tr> </table>			198 43 401.4	22 September 1998 (22.09.98)	DE	2,247,856	23 September 1998 (23.09.98)	CA	<p>(74) Agent: DE KOCK, Elbie, R.; Russell Reyneke, Two Bentall Centre, Suite 700, 555 Burrard Street, Vancouver, British Columbia V7X 1M8 (CA).</p> <p>(81) Designated States: AU, CA, DE, GB, JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p>
198 43 401.4	22 September 1998 (22.09.98)	DE							
2,247,856	23 September 1998 (23.09.98)	CA							
<p>(71) Applicants (for all designated States except US): BALLARD POWER SYSTEMS INC. [CA/CA]; 9000 Glenlyon Parkway, Burnaby, British Columbia V5J 5J9 (CA). DBB FUEL CELL ENGINES GMBH [DE/DE]; Neuestrasse 95, Nabern, D-73230 Kirchheim (DE).</p> <p>(72) Inventors; and</p> <p>(75) Inventors/Applicants (for US only): ST-PIERRE, Jean [CA/CA]; 2-2225 West 39th Avenue, Vancouver, British Columbia V6M 1T8 (CA). CAMPBELL, Stephen, A. [GB/CA]; 11323 261st Street, Maple Ridge, British Columbia V2W 1H2 (CA). WATSON, Mark, K. [CA/CA]; 20276 - 93B Avenue, Langley, British Columbia V1M 1Y7 (CA). SEXSMITH, Michael, P. [CA/CA]; 3677 Baird Road, North Vancouver, British Columbia V7K 2H3 (CA). DERFLINGER, Monika [DE/DE]; Kirchstrasse 60/1, D-73272 Neidlingen (DE). HORNBURG, Gerald [DE/DE]; Gansackerweg 155, D-89275 Elchingen (DE).</p>			<p><b>Published</b></p> <p><i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>						
<p>(54) Title: ANTIFREEZE COOLING SUBSYSTEM</p>									
<p>(57) Abstract</p> <p>Liquid cooled systems having coolant circulation loops (136) must often operate in below freezing conditions. For instance, in various applications certain fuel cell systems (10) must be able to tolerate repeated shutdown and storage in below freezing conditions. Conventional glycol-based coolants typically used for internal combustion engines are generally unsuitable for use in the associated fuel cell cooling subsystems due to the presence of additives and/or inhibitors which are normally included to deal with problems relating to decomposition of the glycol. With additives or inhibitors present, the coolant conductivity can be sufficiently high as to result in electrical shorting or corrosion problems. However, provided the purity of the coolant is maintained, a pure glycol and water coolant mixture may be used as a fuel cell system coolant to obtain suitable antifreeze protection. Adequate purity can be maintained by including an ion exchange resin unit (158) in the cooling subsystem.</p>									

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						